UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
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THE WARTIME PROGRAM OF SOIL CONSERVATION BIOLOGY

Statement of the Biology Division
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SELECTIVE SERVICE FOR EVERY ACRE

The slogan, "Selective Service for Every Acre," states an objective for the Soil Conservation Service with the Nation at war. Dr. Hugh H. Bennett, Chief of the Service, emphasized this objective when he recently wrote: "There has always been one basic reason for soil conservation -- the extent of its contribution to the welfare of mankind. Today that welfare depends on our success with respect to the prosecution of total war. It is not enough to conserve soil and water; soil conservation must result in the utmost yield, without waste of any kind, of those products of the soil needed by the United Nations,"[1] Such yield is shown by the following figures which tell the story of increased production.

Studies by the research divisions of the Soil Conservation Service and other research groups indicate that on extensive acreages in Ohio, Indiana, Missouri, and Iowa conservation farming increases corn yields from 5 to 35 bushels per acre. Concerning one conservation practice, contour cultivation, R. E. Uhland writes: "Should this practice be extended to one-third of the corn acreage of the Corn Belt, the annual production of corn would be increased by almost 100,000,000 bushels. This is based upon hundreds of observations and is supported by experimental data."[2] In Illinois experiments show that, without conservation practices, it takes 7 acres of the poorest land to produce a yield equal to the crop yields from 1 acre of the best land. With conservation practices, such as control of length of slope, contour cultivation, use of soil amendments, and appropriate crop sequences, 2 acres of the poorest land produce yields equal to 1 acre of the best land when the latter is cropped without those practices.

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[1]Total Conservation. H. H. Bennett, Soil Conservation 7 (10): 233-235. April 1942.

[2]The Facts About Conservation Farming and Yields. R. E. Uhland, Soil Conservation 7 (11): cover. May 1942.

In the hardland wheat section of the southern Great Plains conservation studies have shown that wheat production can be maintained at present levels on two-thirds of the present acreage if farmed under a soil- and moisture-conservation program. Cotton lint yields, too, during a 12-year period, were 33 percent (68 pounds) greater per acre in the Texas Panhandle when the fields were terraced and contoured. That conservation means increased production is also shown by yields of other crops under good land-management practices, for example: Beans, 47-percent increase per acre in New Mexico (4-year average); sorghum grain, 56-percent (262 pounds) increase per acre in Texas (1 dry year); grain sorghum, 19-percent increase per acre in South Dakota (3-year average); corn silage, 3-ton increase per acre in New Jersey in 1938; potatoes, 8-23 bushels increase per acre in New Jersey (1940-41); tomatoes, 33-percent increase per acre in New Jersey; grapes, 80-percent (98 pounds per 100 vines) increase per acre in New York; and raspberries, 35-75 percent increase per acre in New Jersey.

To make every acre produce good yields, we must recognize, of course, the fact that agricultural lands are not all useful for the same purpose. Soil type, slope, erosion conditions, and climate are factors which influence the agricultural capabilities of the land. Recognition of land for what it is capable of producing is a prerequisite to good planning and management. To try to produce high-yielding crops on low-class land, or conversely, wasting high-class land on low-yielding crops, is poor economy.

Agricultural lands may be divided into two groups: Those suitable for cultivated-crop production, and those suitable for the production of hay, forage, timber, or other products. Some lands are not subject to erosion and under ordinary management may be used for the continuous production of cultivated crops with moderate to high yields (land-use capability, class I). Other lands must have simple erosion control or management practices for permanently productive use (class II). These land classes comprise the best croplands of the country. Many thousands of acres require intensive and complex management for safe use with production of at least moderate-yields (class III), and some land is so steep, severely eroded, or poor that it should be cultivated only occasionally and used chiefly for hay or pasture (class IV).

Lands not suitable for cultivation, yet subject to little erosion or other deterioration (class V), are best suited for use as range, pasture, or woodland. Somewhat steeper or thinner land, designated as class VI, requires special practices for permanent use, while the rough, steep, eroded, or arid lands that require severe restrictions for range use or that are suitable only for woodland or limited pasturage make up class VII.

Finally there are marshes, sloughs, box canyons, escarpments, rocky knolls and outcrops, sand dunes, deep gullies, and galled spots that are clearly unsuited for the production of cultivated crops, hay, pasture, or trees. These are examples of class VIII land -- wildlife land -- and to them must be added, as far as management is concerned, the area taken up by field borders, stream banks, ditch banks, and odd corners. They total, according to recent careful estimates, some 33,000,000 acres, composed largely of small areas, a half acre here, 10 acres there, and they represent 2½ percent of all farm land and public land in agricultural production. They comprise in all an area equal in size to the State of New York. Of this total, more than a third, about 11,300,000 acres of class VIII land, is within organized soil conservation districts. The class VIII lands erode, often more than others do, but they can be controlled and made to produce crops -- crops of useful plant and animal life -- which is the "selective service" for these lands. The land-management biologist renders one of his most important services to the war effort by lending his particular skill toward putting as many as possible of these acres to productive use.

Increased production, however, is only a part of the contribution made by the Service to farmers and ranchers, and through them to the Nation. Equally important are demonstrable savings in labor, fuel, and equipment achieved through putting corn on the land best suited to corn, grazing livestock on the land best suited for pasture, and devoting to wood production the parts of the farm most suitable for tree growth. The biologists and other Service technicians help the farmer plan his farm organization and efforts in order to effect such savings.

BIOLOGICAL PRACTICES

In the months before the entry of the United States into the war the Biology Division of the Soil Conservation Service was devoting a great deal of attention to the special part it could play in the national defense program. After Pearl Harbor its efforts were directed toward making the greatest possible contribution to an aggressive war effort. It was recognized from the outset that certain problems needed concentrated attention. Typical of these was the relation of insect populations to conservation practices. Another was how the lands devoted to wildlife treatments could produce the greatest material benefit -- a useful goal for wildlife conservation in war or peace.

Through its cooperation with soil-conservation districts, which now (July 1, 1942) number 771, the Service is in a position to provide technical assistance to farmers and ranchers in effectuating widespread programs for war production on wildlife lands as well as on all other land classes.

What products from wildlife lands can contribute to the war effort? In the first place, foods of all sorts are needed. Among the most important wild foods are fish and fruits. With commercial fishing reduced and large quantities of fish going to the armed forces, fish for civilian consumption can, in part, be produced locally in farm ponds. Dried cultivated fruits, likewise, are becoming more difficult for the civilian to obtain. Farmers and country townsfolk have long used wild fruits -- often keenly competing for favored plum thickets and berry patches. Suitable plants in gullies, along fence rows and stream banks, or on gall spots often will produce wild fruits in quantity.

The majority of wild furs are produced on farm land, and, if prices indicate demands, furs are much needed now. Before the war a large proportion of the furs used in this country were imported from sources no longer available to us. Despite a large reserve, we can anticipate increasing needs for furs of domestic origin. The portions of farm lands that produce furs are streams, sloughs, drainage ditches, marshes, strip mines, and other so-called idle or waste areas.

These, then, are the fields in which the Soil Conservation Service is attempting to make its contribution to the Nation through the biological phase of its conservation work. With little research to guide the way in the management of fish, wild fruits, or fur bearers on farm and ranch lands, biologists of the Service, during the past several years, have devised practical management recommendations to accomplish their task, and the following pages discuss the work of the past year.

Insects and Conservation Practices. Alertness to the dangers of insect depredations to farm crops is one of the means whereby the Biology Division of the Service renders valuable aid to the wartime program of agricultural conservation. Information on the control of insect pests is currently distributed to field personnel. Precautionary measures are taken to prevent damage, and attention is given to the improvement of land management practices adverse to harmful insects.

Cooperation between the Service and agencies concerned with entomological problems has progressed. In the northern Great Plains cooperative studies on cultural methods of controlling grasshoppers have resulted in the determination of the types of tillage that best reduce the hatchability of grasshopper eggs. Attention to corn-borer problems has been a feature of biology work in the upper Mississippi region, while in the northeast cooperative observations have been made on cut-worm problems in relation to strip cropping. In Virginia analyses of the effects of various conservation practices on insect populations are being made through cooperative research, and similar work has been done in a few other States.

Pond Fish Management. A thorough resume of farm fish management methods has been prepared and issued to field men of the Service during the past year.[3] The field application of these methods varies considerably from place to place, with "fish farming" at present a more exact technique in the deep South and Southeast than elsewhere in the country. With local adaptations the practice is spreading. In 1941-42 more than 600 ponds built by farmers and ranchers in soil-conservation districts were stocked with appropriate kinds and numbers of fish, and management recommendations advised. Through the cooperation of the United States Fish and Wildlife Service and various State game and fish departments farmers in soil conservation districts are now able to obtain the kinds and numbers of fish most adapted to management in their ponds.

That fish farming may well become of major importance in the United States can be seen from its values elsewhere. For example, in 1934 the 185,000 acres of ponds in Poland yielded approximately 22,000,000 pounds of fish. Pondfish in the Philippines were produced at an annual rate of 98,000,000 pounds. In our own country conservative estimates show that with a reasonable expansion of the 1941 rate of accomplishment in soil conservation districts, 37,000,000 pounds of pondfish could be made available to rural people in the Southeast alone by a relatively simple fish management program. At a comparatively low cost such a program would annually provide each individual on Southeastern farms with 50 pounds of high-protein food in a region where such food is scarce. To do this only the better sites, estimated at about 92,000 on 613,000 farms in the Southeast, would need development into ponds averaging about 2 acres in size, and a slight acceleration over the present rate at which the Service is assisting with farm fish management would be required. At present, pond fish production is being planned on 6 to 8 percent of all farms in southeastern soil conservation districts for which conservation plans (some 19,600 in 1941) have been prepared.

Wild Fruits for Human Use. Wild plum is a thicket-producing, erosion-control shrub highly valued for wildlife cover. It has the additional merit of being highly prized as human food. Wildlife areas on farms, when planted to plum, therefore, have a multiple purpose. The planting plans for the Soil Conservation Service this year called for the planting of 502,000 plum seedlings of 3 species, and many farmers in addition seeded wild plums directly, a practice which lowers the cost of establishing the plants. Wild cherries, likewise, were used to a considerable extent -- 477,000 seedlings were planted. Especially favored was the large western sand cherry (Prunus besseyi), an excellent soil stabilizer in sand-blow areas and a producer of a large well-flavored fruit. Of all shrub seedlings planted in the spring of 1942 plums and cherries made up 17 percent.

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[3]Fish Farming. L. V. Compton, SCS Mimeo. June 1942.

Many other fruit producers -- used for preserves, jams, jellies, and sauces -- were planted. Hazelnuts and filberts, blackberries and raspberries, currants, high bush cranberries, elderberries, grapes, and asparagus were among the plant species much used on sites where they contributed to the holding of soil and prevention of excess run-off. As a whole, species of value for human food comprised 30 percent of all seedlings planted.

Emphasis is being given to the use of improved fruit-bearing plants, with hybrids and improved strains of the western sand cherry, filbert, and elderberry now receiving field trial. The better strains of wildlife plants are just as valuable in providing food and cover as are ordinary plants, and they have the decided advantage of being considerably more useful to farmers and ranchers. Our best cultivated plums and grapes came originally from wild American stock. Other species offer equally excellent opportunities for development, and as experiment stations and other research agencies make improvements, the Soil Conservation Service uses such as are available.

Farm Fur-bearer Management. During the past year close attention was given by the biologists of the Service to the production of furs as a part of the farm enterprise, and preparation of a compendium of fur-management recommendations was inaugurated as a guide to the practical field management of wild fur bearers on farm lands. An example of the importance of farm land as a source of furs may be seen in an analysis of fur production in Iowa. The most highly agricultural State is no mean producer of wild furs. With little management, its 53,155 square miles of farm land yield about $625,000 worth of furs annually. The majority of the 272,000 muskrats, 105,000 skunks, 30,000 opossums, 29,000 minks, and 15,000 raccoons are believed to be produced annually on not more than 4 percent of Iowa's farm land; and most of these come from the 628 square miles of land which are not suitable for ordinary farming practices. There is ample evidence to show that simple practices like the protection of stream banks from fire and livestock may increase fur bearers as much as 100 percent, and such recommendations are being made to farmers who are receiving technical assistance from the Service.

EFFECTUATING THE PROGRAM

On July 1, 1942, the Soil Conservation Service was reorganized in order to adjust its personnel and operations to the reduction of funds resulting from termination of the Civilian Conservation Corps, flood control, and water facilities work which it previously administered. This reorganization has resulted in increased efficiency, and permitted a transfer of about $1,000,000 from overhead to actual field operations. Line and staff functions were reoriented, bringing them together at a point closer to the work in the field.

The initial organization of the Soil Conservation Service brought technical and administrative phases of the program together in Washington and at demonstration projects scattered throughout the country. As the program grew, regional offices became necessary and it was here that technical direction and administration joined in order to be closer to field operations. Further growth of Service activities, particularly through cooperation with soil conservation districts, required reallocating the juncture -- through area offices. In the present organization the number of divisions in Washington has been reduced and operational functions have been combined under the supervision of a Chief of Operations. Administrative divisions likewise were rearranged. In the field, the number of regions has been reduced from 10 to 7. In the existing regional offices line and staff divisions have been changed to parallel those of the Washington office. Area offices have been abandoned, their functions now brought together at a district office level, thus providing a smaller geographic operational unit. Administrative offices have been established at the State level.

The district office now receives technical guidance and assistance directly from the regional office. Two soil conservationists (zone representatives) from the regional office serve several districts and are responsible to the regional Chief of Operations for the technical excellence of all phases of the Service program within the zone in which they work. In this they draw upon technical division chiefs to devise local policies and standards and for help with complex technical problems. These men serve in part as biologists, for they carry to the field the biological phase of the program in their respective zones. Thus all units of the Service now receive biological assistance, where formerly this was provided primarily to those reached by the limited biological personnel. Where needed, technical specialists may be assigned to districts, but for the present special assistance will be limited.

With respect to the biological phase of soil conservation work, the following organization now exists: (A) Biology Division (two men) in the Washington office, which develops broad national policies and standards; coordinates biology with other phases of soil conservation work; cooperates with other agencies; assembles and disseminates information; and is responsible for the technical excellence of the biology work. (B) Biology Division in the regional office (one man) which develops within the national program local policies and standards; trains field personnel in the application of policies and standards; cooperates with other technical divisions of the Service and with other interested agencies; assists in solving complex field problems; and disseminates information. (C) Zone representatives, who carry from the regional office to a geographic subdivision of the region the simpler biological and other techniques; are responsible for solving simple biological problems; and analyze field problems in order to bring appropriate technical

attention to them so that they may be solved. (D) District Conservationists, who are administratively and technically responsible for the application of the biological and other aspects of the soil conservation program within a group of soil conservation districts; are accountable for the quantity and quality of farm and ranch conservation planning and accomplishments; and are responsible for solving the simplest biological and other problems or calling to the attention of proper personnel problems beyond their own capabilities of solution. (E) Work unit leaders, who help landowners and operators plan farms and ranches usually within an individual district, and assist in the accomplishment of those plans in accordance with (1) the policies and standards of the Service, (2) the program of the soil conservation district or other unit in which they work, and (3) the abilities and resources of the land owner and operator.

APPLYING BIOLOGICAL PRACTICES

In the report of the Service to this committee for 1940-41 the simplification of general measures was stressed. It was stated, "In view of the fact that it is the landowners -- the farmers and ranchers -- who must carry on all practices adopted, obviously unless the practices are simple, easy to understand, and above all, require no special biological knowledge or experience, they are foredoomed to failure. By the same token, the man best qualified to simplify each biological measure and make it feasible and practical, is the biologist himself. Consequently, unless biological measures are capable of being grasped and applied by one who is not himself a specialist, they are relatively worthless, as far as large-scale application is concerned. In other words, although devising new measures requires expert knowledge, application of wildlife measures should not depend upon specialists in biology . . . If the practices can be understood and applied by anyone with average intelligence, there is no limit to the extent to which they can be spread."

The prosecution of this philosophy of application now is most timely. Biology measures advocated by the Service can, when simplified, be carried to the field with a minimum of lost motion in training field representatives. By the use of technical standards and guides all of the simpler measures reach the farmer and rancher without the personal attention of a specialist. Through the use of simplified practices a farm planner can work not only with an individual farmer, but with a small group of farmers, planning with them the practices they can put into effect themselves with little or no technical guidance. Through group planning, too, the more complex problems and practices receive attention, thus building a foundation upon which the farm planner later can devote detailed and concentrated effort.

Analysis of the application by nonbiologists of simplified biological measures have been made in several parts of the country. The figures show 61, 73, and 75 percent planning efficiency in three regions within a year of the inauguration of this type of program. In order of their acceptance by farmers and ranchers the biological measures adopted most widely are: First, the protection and management of water supplies -- ponds, reservoirs, dugouts, and springs; second, the protection and management of lands unfit for the production of cultivated crops, hay, pasture, or trees; third, the protection of gullies and drainageways; and fourth, the development and management of perennial herbaceous field borders. Shrub border developments, streambank protection and management, beaver management, and miscellaneous other practices have received local emphasis.

IMPROVING THE PROGRAM

Observations and evaluation trials for the improvement of the biological work continue to be an important feature of Service effort. In several States trials on the management of farm ponds for fish production are being conducted by conservation departments or educational institutions cooperating with the Service, and similar cooperative work is being done with the United States Fish and Wildlife Service. Other observations and trials on uses of herbaceous plants, direct seeding of woody plants, streambank management, hedge management, and the relationship of rodents to vegetation and conservation structures have also been undertaken. There has been a rather uniform effort to reduce woody planting stock requirements to those species of demonstrated value and low-cost production.

There is still need for basic research upon which to further develop biological aspects of soil conservation work. The present report has already indicated the need for fundamental studies on farm fishpond management in many parts of the country, similar to those made available by the Alabama Experiment Station. Research on the management of farm furbearers by means usable to the farmer would be most desirable. For several years reports by the Service to this committee have pointed out research needs in insect and rodent control. Land-management problems involving rodents and insects and effecting the war effort must now be met more or less by stopgap means although the Service is using the best available information in meeting those problems as they arise. Some of the measures necessary at present are detrimental to the effectiveness of other phases of soil conservation work. For example, the control of European corn borer and of cotton boll weevil may require, in certain areas, the destruction of crop residues needed for soil protection. It is only fair to say that the agencies directly concerned with control of these insects are aware of erosion hazards and that various compromise recommendations have been developed.

It may now be inappropriate to undertake research, with manpower and money needed for the more immediate task of winning the war. However, in the post-war period when, it is presumed, public works will play an important role, it is to be hoped that rodent and insect problems relating to conservation practices will be carefully studied and the research so much needed will be done. Conversely, scientific analyses of the effects of soil conservation practices on wildlife can serve as useful guides for future work. The answers to such problems must be forthcoming before the land management biologist can adequately fulfill his obligation to the land operator. Service biologists continue to suggest that whenever feasible, universities and research institutions, private and public, direct attention to solving biological problems related to the use of the land.

COOPERATION

The Service has cooperated with numerous State and Federal agencies on biological matters. Examples have been cited above, as the arrangement whereby soil conservation districts receive priority for obtaining fish from Fish and Wildlife Service hatcheries for stocking farm ponds. Other cooperative efforts, as pointed out above, dealt with insect control. Regional problems have been approached through the joint efforts of the Service and the Bureau of Entomology and Plant Quarantine.

Last year (1941) it was reported that 11 State game commissions were assisting soil conservation districts in the type of conservation practices successfully demonstrated by the Soil Conservation Service. The number this year totals 20. Some of these States are using Federal aid in wildlife restoration (Pittman-Robertson) funds, while others assist in various ways. Minnesota has instituted a type of land-utilization and flood-control program patterned after that of the Service, in which the State has developed a stream-bank management program of value to wildlife. Additional State wildlife refuges have been established on Soil Conservation Service land utilization areas in New York, North Dakota, Montana, Colorado, Oklahoma, and Arizona. Florida, Texas, South Dakota, and New Mexico have new refuge areas on land-utilization projects since the previous report.

SERVICE PROGRESS

It has been recognized for a number of years that sound use of the land, even though not directly concerned with the management of wildlife, is generally beneficial to desirable species of birds and mammals. Recent studies give further weight to previous evidence. Well-managed range lands, for example, have recently been shown to support about twice

as many birds as comparable acreages of unwisely used range.[4] Managed farm woodlands, strip-cropped fields, hedge-bordered fields, and other well-managed lands have shown like benefits to wildlife by actual census. Eight years of soil conservation practices upon its watershed have made a trout stream of once silted, troutless Gilmore Creek in Minnesota.

In tables I, II, and III are presented statistical data indicating the number of, and acreage included within, established soil conservation districts; number of farms and ranches which have been planned and the acreage included in those plans; and the major soil and moisture conservation practices planned and established through the work of the Service. There have been many other unrecorded results from the Service's work -- e. g., many farmers and ranchers who have observed conservation practices on farms and ranches where the Soil Conservation Service has assisted, have applied some of the same types of work to their own lands without assistance from the Service. Other agencies have adopted biological and other practices successfully demonstrated by the Service and are applying them to the land in many places where the Soil Conservation Service has never operated. As yet, however, practicable means have not been developed for assembling and presenting such results.

The tables referred to are here printed in full, as follows:

TABLE I. -- Growth of Soil Conservation Districts by 6-Month Periods

Date	Number of districts	Acres
Dec. 31, 1937	14	8,619,102
July 1, 1938	66	35,546,929
Dec. 31, 1938	103	54,001,264
July 1, 1939	161	88,436,148
Dec. 31, 1939	217	119,490,878
July 1, 1940	314	189,752,397
Dec. 31, 1940	429	267,075,323
July 1, 1941	548	332,088,660
Dec. 31, 1941	679	405,714,000
July 1, 1942	771	451,990,000

[4] The Effect of Revegetation on the Small Bird Population in Arizona. Gale Monson, Jour. Wildlife Management 5 (4): 395-397. October 1941.

TABLE II. -- Number of Farm Plans and Acres by Fiscal Years

(The figures are cumulative and except for 1942 do not include public land areas)

Date	Number of Plans	Acres
1935	9,608	1,259,684
1936	30,584	5,887,179
1937	51,430	10,304,798
1938	63,804	15,654,871
1939	84,445	22,019,856
1940	116,946	39,851,152
1941	174,146	52,936,663
1942	233,413	56,631,880* 13,124,602**

*Private.
**Public.

TABLE III. -- Major Soil and Moisture Conservation Practices Established as of July 1, 1942

Practices	Unit	Planned	Established
Contour cultivation	Acres	9,126,386	6,451,050
Contour furrows	Acres	2,583,463	1,440,502
Grass plantings	Acres	3,668,993	1,997,783
Woody plantings	Acres	674,576	549,925
Strip cropping	Acres	4,341,172	2,714,816
Terracing	Acres	5,756,809	2,988,436
Woodland improvement	Acres	1,110,597	574,235
Reservoirs and ponds	Number	19,714	14,182

The planned figures are from farm plans written; the established figures are estimates based on sampling.


U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION REGIONS
NORTHERN GREAT PLAINS REGION
5
PACIFIC REGION
7
SOUTHWESTERN REGION
6
UPPER MISSISSIPPI REGION
3
NORTHEASTERN REGION
1
SOUTHEASTERN REGION
2
GULF REGION
4
WESTERN
Portland
Milwaukee
Lincoln
Albuquerque
Ft. Worth
Spartanburg
Upper Darby
WASHINGTON
OREGON
CALIFORNIA
IDAHO
NEVADA
MONTANA
WYOMING
UTAH
COLORADO
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
KANSAS
OKLAHOMA
TEXAS
MINNESOTA
IOWA
MISSOURI
ARKANSAS
LOUISIANA
WISCONSIN
ILLINOIS
MICHIGAN
INDIANA
OHIO
KENTUCKY
TENNESSEE
MISSISSIPPI
ALABAMA
GEORGIA
FLORIDA
SOUTH CAROLINA
NORTH CAROLINA
VIRGINIA
WEST VIRGINIA
PENNSYLVANIA
NEW YORK
MAINE
VERMONT
NEW HAMPSHIRE
MASS
CONN
NEW JERSEY
MARYLAND
DELAWARE
ALASKA
7
HAWAII
7
PUERTO RICO
2
Regional Boundaries
Regional Headquarters
AUGUST 1, 1942